REMARKS

1. Claims 1-10 are pending. Claims 6-8 have been withdrawn due to a restriction requirement.

2. Claims 1-5 and 9 stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 3-13 of copending Application No. 10/591,979. Claims 1-5 and 9 also stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 3-12 of copending Application No. 10/591,978, for reasons set forth in the previous Office Action.

A Terminal Disclaimer under 37 CFR 1.321 (d) to Obviate A Provisional Double Patenting Rejection Over a Pending "Reference" Application is being filed concurrently with this Response for copending Application No. 10/591,979, filed 9/5/2006. Therefore Applicant submits the Examiner's rejection is now moot.

3. Claims 1-5 and 9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over WO 03/022736 in view of JP60-122337, McGrath et al. (US 6,649,145), Bunkin et al., Aquarius, and further in view of Honda Pumps, "Micro-Nano-Bubble generator built-in pump," http://www.hondakiko.co.jp/english/microbubble/index.html. 1999.

4. Claims 1-5, 9 and 10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over WO 03/022736 in view of JP60-122337, McGrath et al. (US 6,649,145), Bunkin et al., Aquarius, in further view of Honda Pumps, "Micro-Nano-Bubble generator built-in pump," http://www.hondakiko.co.jp/english/microbubble/index.html. 1999 and Yabe (US 2006/0054205).

5. Claim 1 has been amended. Claims 2-4 and 6-8 have been cancelled. No new matter has been added.

6. Rejections under 35 U.S.C. 103(a)

Claims 1-5 and 9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over WO 03/022736 in view of JP60-122337, McGrath et al. (US 6,649,145), Bunkin et al., Aquarius, and further in view of Honda Pumps, "Micro-Nano-Bubble generator built-in pump," http://www.hondakiko.co.jp/english/microbubble/index.html. 1999.

Claims 1-5, 9 and 10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over WO 03/022736 in view of JP60-122337, McGrath et al. (US 6,649,145), Bunkin et al., Aquarius, in further view of Honda Pumps, "Micro-Nano-Bubble generator built-in pump," http://www.hondakiko.co.jp/english/microbubble/index.html. 1999, and Yabe (US 2006/0054205).

The Examiner cites "Honda Pumps, "Micro-Nano-Bubble generator built-in pump", http://www.hondakiko.co.jp/english/microbubble/index.html. 1999" as teaching that ultrafined ozone water (micro-nano-bubbles) reportedly last longer than one month under an ambient temperature and atmospheric pressure.

However, as shown in the cited webpage below, the

, at the bottom of the webpage does not at all mean that the matter of the article ("Micro-Nano-Bubble generator" of Honda Pumps) was written in 1999, and Applicant submits that the Examiner is incorrect in so assuming.

Further, it is set forth in http://www.hondakiko.co.jp/english/topics/06.02.22-2.html , shown below, that the publication of "Micro-Nano-Bubble generator built in pump" was in February 22, 2006.

2006.2.22.wed

Our latest Technological breakthrough!!
Development of a High capacity Micro-Nano-
Bubble generator built-in pump.
Combining more than 50 years in designing reliable

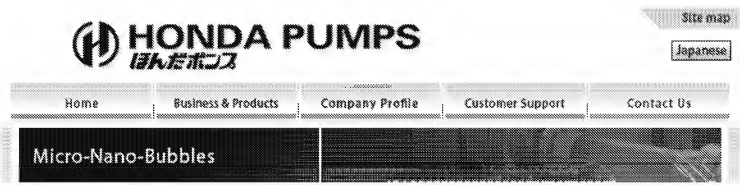
specialty pumps with the latest Micro-Nano-Bubble technologies,
we are pleased to announce the development of a unique High capacity Micro-Nano-Bubble generator built-in pump.
This technology shrinks bubbles that are normally several millimeters to just a few micrometers or nanometers in diameter.
Used mainly for purifying water in dam reservoirs, and in aquaculture.
Click here for more details

The present application has a priority date based on Japanese Application No. 2004-062044 filed March 5, 2004, and is the national stage of PCT/JP05/03810 filed February 28, 2005. Thus, the reference "Honda Pumps, "Micro-Nano-Bubble generator built-in pump" is not prior art.

Further, the inventor for the present application has confirmed this by checking with the author of the paper at HONDA KIKO CO.,LTD.

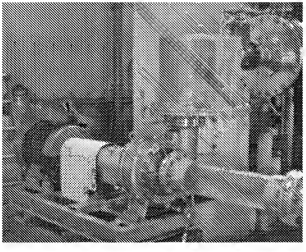
As of February 22, 2006, the Japanese version of the present invention had just been disclosed (the Examiner is referred to Japan Publications JP2005-245817A or JP4144669B. Further, the inventors for the present application had announced the matter of the present application by press-showings and books etc.

In summary, the reference "Honda Pumps, "Micro-Nano-Bubble generator built-in pump" is simply not prior art.

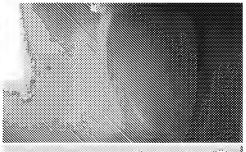


Micro-Nano-Bubbles
Performance curves
Generation of micro-nano-bubbles in progress

Micro-Nano-Bubble generator built-in pump



The bubble which is 0.001 mm to 0.05 mm big is defined as micro-nano-bubble (ultrafine bubble).



Click here for the jet of dynamic ultrafine bubble in video.

※ **Video play requires:**
Windows Media Player(freeware) and Macromedia Flash Player(freeware). Click the icon, and follow the download procedure to install them.

• Applications

Ultrafine bubbles of ozon, oxygen or air is able to function to purify, disinfect or recycle in a large variety of application:

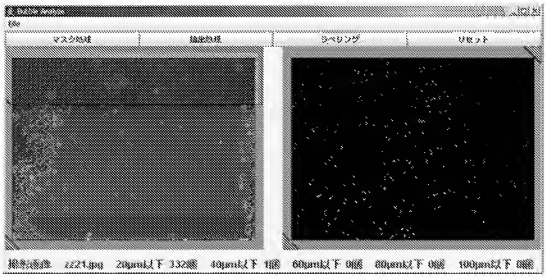
- in the fields of nature: water in the river, pond and sea.
- in the fields of industry: factory wastewater, drinking and sewage water.
- in the fields of fishery: aquafarming.

They are echo-friendly indeed because they never cause any chemical reaction to produce harmful material.
Gas containing liquid is primarily agitated in the pump to form bubbles. The Micro-Nano-Bubble generator re-bubblizes them into ultrafine sizes not bigger than 50μm(0.05mm).
The capacity ranges from 500l/min. to 6000l/min, the largest ever developed in the world.

• Specification

- Micro-Nano-Bubble generator built-in pump with the capacity from 500 to 6000 l/min. stably generates ultrafine bubbles. An advanced model with the capacity up to 15000 l/min. is now under development.
  [RPM: 50Hz(1450min-1) and 60Hz(1750min-1)]
- The pump can handle air containing liquid up to 7%.
- Most of the bubbles are smaller than 0.02mm (20μm) in diameter.
- This technology is under patent application.

Bubble diameters at the flow rate of 200 l/min. (by video image analysis)



Video image taken by a digital micro scope magnified by 50 times.

Bubble diameters measured by an analysis softwear.

Micro-Nano-Bubble generator built-in pump is potentially available for the disposal of ballast water.

The ballast water of ocean going ships has a high chance to generate negative effects on the marine environment by spreading harmful or non-native microorganism unless disinfection treatment is taken before it is disposed into the sea. The negative impacts may include the destruction of ecological system, damage to fishing industry or direct attack to human bodies. Ozone is believed to be very suitable for disinfecting the ballast water thanks to its strong bacteriostatic action which Micro-Nano-Bubble generator built-in pump optimizes by transforming the ozone into ultrafine bubbles.

Micro-nano bubble effect on ozone water.
If the ozone water is not ultrafined, ozone effect will terminate within one to two hours. Ultrafined ozone water reportedly lasts its bacteriostatic action longer than one month under an ambient temperature and atmospheric pressure. (Literature citation)

Impact pressure that the Micro-Nano-Bubble generator built-in pump generates is strong enough to kill microorganism.
The capacity of the Micro-Nano-Bubble generator built-in pump ranges from 200 m^3 to 500 m^3 per hour.

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The Examiner cites Yabe (US 2006/0054205) as teaching generation of nanobubbles by performing the electrolysis and applying the ultrasonic-wave vibration (paragraph 0022). Bubbles are used in cleaning applications, and bubbles of an about 100 nm diameter is expected to have a high cleaning speed (paragraph 0024). For example, industrial equipments are cleaned by the water comprising nanobubbles and an organism is cleaned by the water comprising nanobubbles. The water to be used is electrolyzed water, ionized alkaline water or acid water (paragraph 0026).

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Applicant submits that although Yabe teaches generation of nanobubbles by applying ultrasonic-wave vibration, the nanobubble in Yabe does not have a long-term stability and thus teaches away from "wherein the nanobubbles remain in the solution for at least one month" as recited in claim 1. Yabe describes an effect of cleaning when the bubbles collapse, which confirms the ephemerality of the bubbles taught by Yabe. Moreover, "during application of ultrasonic wave" is set forth in the particle size distribution in Fig.7 of Yabe.

The disclosures in cited references (WO03/0227356, JP60-122337, Bunkin et al., McGrath et al., and Aquarius), disclose that minute bubbles are generated immediately, with the implication that the bubbles dissolve or burst after a short time. The prejudice at the time of the prior art was that the nanobubble disappears quickly because an internal gas is dissolved though the bubble. These prior art bubbles have a half life of a few minutes to several hours depending on the method used to make the bubble. Moreover, because pressure in the bubble is high, the amount of dissolution of the gas in water rises when the prior art microbubble is generated. The disclosure in other cited prior art references also show that the density of the dissolution gas is very high. Though this shows that the made bubble is extremely small, this also shows that the bubble structure is not stable and the bubbles are breaking quickly.

WO03/0227356 discloses how to generate the highly concentrated ozone water by a water discharge with the existence of the gas phase as the form of fine bubble in the discharge area. Oxygen gas is changed to ozone gas by the discharge. Since after the discharge the ozone remover removes the ozone gas, the fine bubble (gas phase) does not exist in the water. So the

invention of WO03/0227356 does not disclose how to generate the long lifetime (one month or more) nanobubbles.

JP60-122337 discloses how to generate the high ozone concentration by using turbulent flow. It means that the turbulent flow is used to collapse the tiny bubbles, not to prolong the lifetime of the bubble. This teaches away from the stability structure feature of the claimed invention.

Bunkin et al. discloses that bubstons could be work as bubble nuclei for the optical cavitations. Bubble nuclei easily expand to the macroscopic bubbles according to the change in environmental condition. These bubbles cannot exist for one month or more.

McGrath et al discloses that oxygen nanobubbles as small as 20-30 nm can supply the oxygen concentration significantly higher than 250 ppm to tissues, and they form irregular networks that nearly completely cover hydrophobic surfaces. Since the high oxygen concentration is derived from the nanobubble, these nanobubbles have short lifetime. The nanobubbles are distinct from nano bubbles of claim 1.

Applicant submits that none of the references taken singly or in combination teach or suggest claim 1.

Therefore, Applicant submits that claim 1 is patentable and is not obvious under 35 U.S.C. 103(a) in view of WO 03/022736 in view of JP60-122337, McGrath et al. (US 6,649,145), Bunkin et al., Aquarius, in further view of Honda Pumps, "Micro-Nano-Bubble generator built-in pump," http://www.hondakiko.co.jp/english/microbubble/index.html. 1999, and Yabe (US 2006/0054205).

Dependent Claims

Claims 5, 9 and 10 depend on claim 1. "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5

USPQ2d 1596 (Fed. Cir. 1988). Therefore, in light of the above discussion, Applicant submits that claims 5, 9 and 10 are also allowable at least by virtue of their dependency on nonobvious claims as well as the additional limitations recited by each of these claims.

In view of the above, Applicant submits that the application is now in condition for allowance and respectfully urges the Examiner to pass this case to issue.

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The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

April 28, 2011
(Date of Transmission)

Lonnie Louie
(Name of Person Transmitting)

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